

# The Chemical Age

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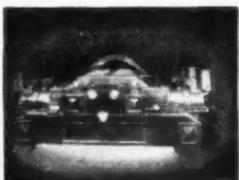
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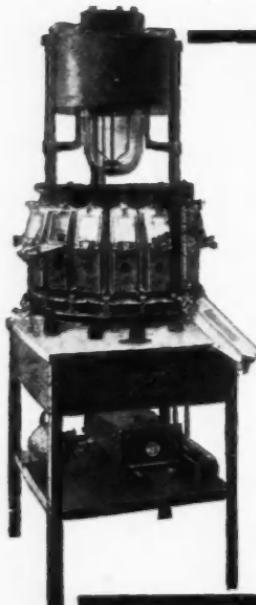
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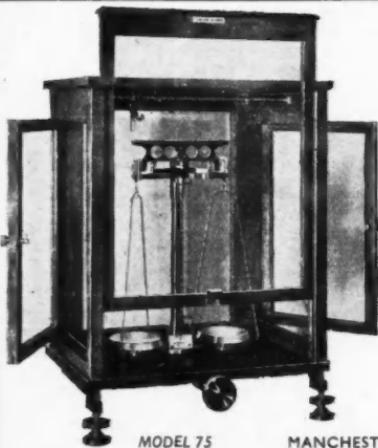
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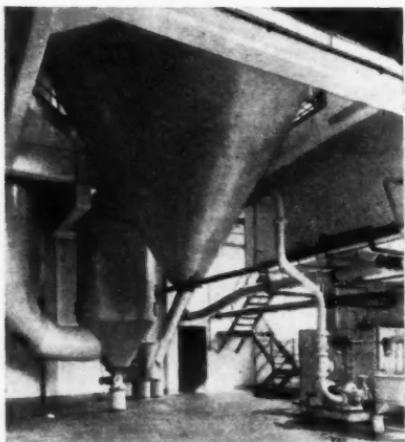
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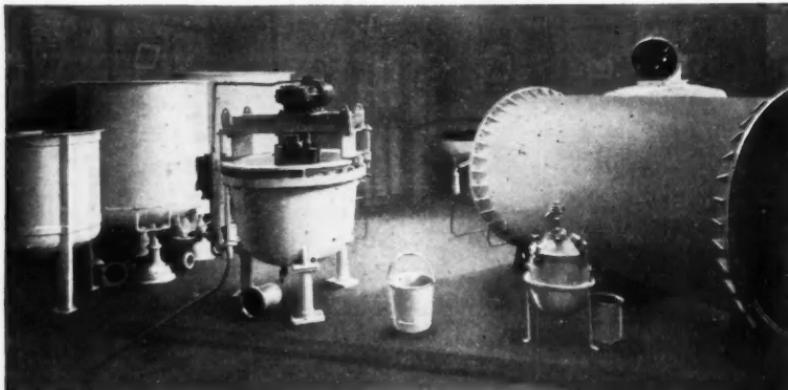
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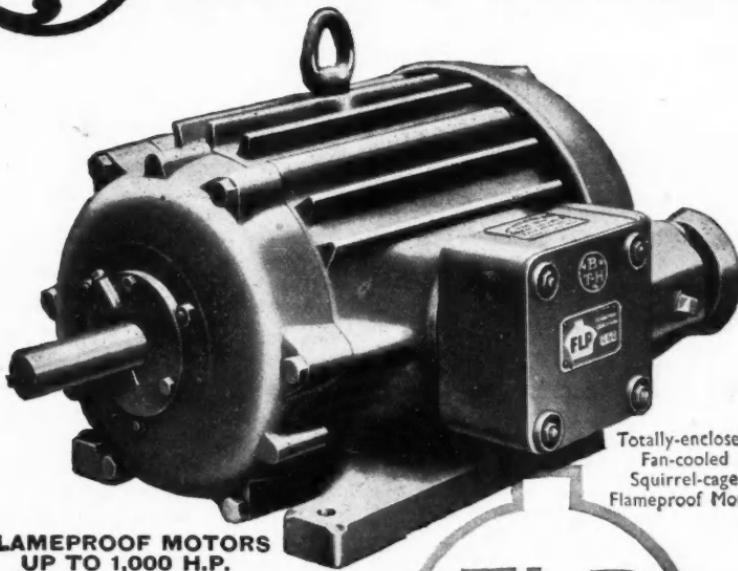
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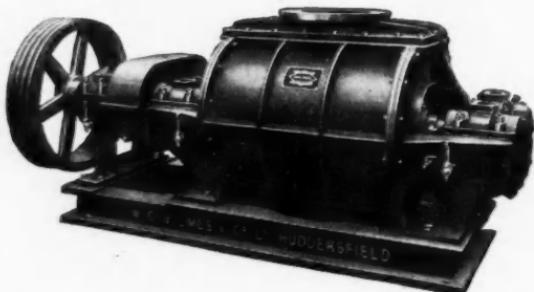
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## German Industrial War Potential

THE war position is such that it is proper for us to begin to think about the post-war settlement of the aggressor nations. It is agreed on all sides that one outcome of this war must be freedom from the fear of subsequent wars. Perhaps we shall do well not to look too far ahead. It takes no more than a generation to forget what war is like. A quarter of a century ago we were quite sure that mankind would never go mad again; but the madness was there, not very far below the surface. That is a potent reason why those who have now learned their lesson for the second time in a generation, should apply it before it can be forgotten, for the benefit of those who have never known it. It is doubtful whether we shall ever abolish war; the idea of war may be too deeply ingrained in human nature for it to be eradicated, but at least we can and must do whatever is possible to withhold the power to make war from those in whom the desire is overstressed, until that desire shall itself have been uprooted.

In the first memorandum on post-war policy signed by Members of both Houses of Parliament and published in May, 1943, it is stated that "Among the first duties of the Inter-Allied Council of Control would be the

dismantling of the aeroplane industry and the control and, where necessary, the closing down of Germany's war potential, including the heavy and chemical industries to the extent to which they are the basis for the production of munitions." It is clear that some drastic reduction of Germany's industries is contemplated. A further memorandum issued in August of this year has pointed out that the main factor governing reparations is the general restoration of European prosperity, and that the foundation stone of that prosperity is a general sense of security. The Post-war Policy Group has also pointed out that the experience of the last 30 years has shown that when Germany flourishes industrially, the feeling of insecurity grows throughout Europe. The imposition of reparations is not the way

to achieve any measure of security after the war, and will do more harm than good to the rest of Europe. What Europe wants is not just the restoration of buildings, works, and so forth, but the setting of its peoples to work in useful and gainful employment, so that they can rebuild what the Nazis have shattered. The Post-war Group suggests the transference to the United Nations, severally or jointly (in some instances by ownership and in

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others by control), of Germany's means of industrial production—mines, heavy industrial equipment of all kinds, and all such natural assets or raw materials as would not only repair the havoc deliberately effected by Germany in European countries, but also maintain in efficient working condition the industries of those countries for a fixed period of years.

Sir John Wardlaw-Milne, who is Chairman of the Conservative Foreign Affairs Committee, reviewing these findings, has recently stated that Germany, being a large agricultural country, can largely supply her own needs in that direction, but that she must not be allowed to regain a position of industrial importance in the world until her existing plant and machinery have been made available to restore the damage she has done, and then only to an extent which shall prevent her from being a danger to the world in the future. And he goes on to say "in no circumstances can Germany be allowed an iron and steel industry after the war except under the strictest possible supervision, and then only to a limited extent." What Sir John has said about the iron and steel industry applies equally to the chemical industry and to that portion of the engineering industries that specialises in the manufacture of chemical plant. No one liked German industrial methods in times of peace. Government subsidies, secret cartels, mass production of blocking patents, the application of politics to business, and many other questionable practices, carried German trade throughout the world and put the Germans in a position of gaining experience (often at other people's expense) in many forms of industry, and pre-eminently in the chemical and chemical plant industry.

But if it is generally agreed that German industry must be controlled, further questions and problems arise. How and by whom is it to be controlled? Must we keep an army in occupation for a century, to ensure that control is effective? Can we spare enough experts to control every part of Germany and every phase of German industry? How long is the control to last? It is one thing to lay down a rule, and quite another to apply it. Control of this nature will set up a corresponding reaction, and the legend will grow up in Germany that the German must live for revenge. That spirit, the very spirit that we must exorcise, will

lead to deliberate and widespread efforts to avoid the control, to do those things that are forbidden. We must examine with the greatest care the long-term implications of whatever policy we decide upon.

What is our long-term policy? Should it lie in attempting to forbid certain industries to Germany? Should it lie in compulsorily amalgamating German firms to Allied firms with restrictions as to what goods shall be made by the German branches? Unless Germany is to be under control for a century to come, and that seems unthinkable, none of these things appear to offer lasting peace if the German nation does not wish for peace. Education in the ways of peace, the same intensive preaching in schools directed to the preservation of peace as has been given to the young Nazis in the direction of war is one way of implanting peace, but it is slow and must start upon very unpromising material—a whole generation of young savages brought up under Hitlerite propaganda. The withdrawal of facilities for technical education might effect the de-industrialisation of Germany within a generation, particularly if the rest of the world obtained thereby a sufficiently long lead. Somehow we fail to see clearly how the Germans can be prevented for a sufficiently long time from re-creating their war industries unless we are prepared to occupy the country physically. Sir John Wardlaw-Milne has said that to permit the Germans complete restoration of their industrial economy, *at any rate, in the early years after the war*, would be to sow the seeds for a further outbreak of violence before many years have passed. He appears to realise the difficulty of indefinite prolongation of this period of control. Our view is that as soon as control is removed, the danger will become positive.

Our objective is not to destroy German industry to remove an inconvenient competitor; if that were our objective we should be no better than our enemies. Our objective is the maintenance of peace by preventing the warlike nations, Germany and Japan, from forging weapons of war until their desire to use them has been eradicated. As the German has disturbed the peace of the world consistently since the days of Attila, we appear to have set our hands to a pretty formidable task.

## NOTES AND COMMENTS

### Social Security

THE Government's social insurance plan is neither much better nor much worse than the Beveridge scheme on which it is palpably based. The White Paper embodying it takes the business man's breath away by its ambitious assumptions and optimistic speculations. The Government has committed itself, at a time when a great part of the national wealth has been shot away in self-defence, to the compulsory insurance of every man, woman and child in these islands for all basic needs from the cradle to the grave. The total cost, to be provided variously by contributions from employers and workers and by levies on taxpayers and rate-payers, will reach the prodigious figure of £650,000,000 in the first year. One of the unanswered questions so far is when the scheme will actually be brought into force. Another is how at this stage the nation can be judged to have resources sufficient to make certain the abolition of want in every class of the population. If this scheme or anything like it becomes the law of the land income tax will remain excessively high for generations to come. Employers will clearly do their best to shoulder any new burdens imposed by Parliament, but they cannot shut their eyes to the fact that they will be prejudiced in international trade competition unless some substantial relief is afforded them.

### Need for Private Enterprise

WORKERS in general are now subject to income tax and the heavy additional contributions to be imposed upon them for social insurance may make the employers' position more difficult still by leading to demands for higher wages on that account. The Government must be presumed to have taken these various factors into account, for none have uttered more serious warnings against the dangers of inflation than its leading spokesmen. In some ways the most important sentence in the White Paper is not one of its numerous promises of benefit, but its reminder that "when the new scheme is in operation it will be for the nation to respond by a fresh out-

burst of that creative energy which has marked the greatest period in our history, and is vitally necessary in the years now before us." In fact, there can be no general security without individual enterprise, and if the Government fails to preserve the second none of its legislation can conceivably secure the first.

### Petsamo Nickel

THE cession of the district of Petsamo by Finland to the Soviet Union, in accordance with the terms of the armistice of September 19, brings a useful source of nickel under the direct control of Russia. It may be safely supposed that Germany's anxiety to keep on good terms with Finland and her reluctance to withdraw from these arctic wastes were influenced by the desire to keep control as long as possible of a ready supply of this valuable war material; but that is at an end now, and the nickel mines have passed into the hands of our Ally. Not much news of the present condition of the mines has come to hand; they have been attacked from the air, and a certain amount of land fighting has taken place in the neighbourhood. The probability is, however, that they are not seriously damaged, and can be put into commission without great delay. British industry was interested in the mines, as a certain amount of capital has been invested in them: we reported in June, 1939, that the Mond Nickel Company was working a concession there, from which it was hoped to produce a Bessemer matte to be shipped to Britain for final treatment. An output of a million lb. of nickel and 500,000 lb. of copper per month was then planned. Even then, however, all other sources of nickel was regarded as puny compared with the vast Canadian deposits; and even though Soviet law does not permit the grant of mining concessions to foreigners, ample British supplies of nickel will still be assured.

### Fuel Research in India

UNDER the impact of war, fuel research in general, and the economic utilisation of fuel in particular, have made great strides in this country; and the subject will gain rather than

diminish in importance in the years following the close of the war. It is significant, therefore, that the Government of India should have decided to establish a Fuel Research Institute. The Government is to be congratulated on its timely decision. Great changes have taken place in India's economic system as a result of the war, and the shifting of the full Allied armed strength against Japan, as soon as Germany has surrendered, will accentuate this development yet further. In addition, it is estimated that, at the end of the war, India will own Sterling balances somewhere in the neighbourhood of £1,000,000,000, the liquidation of which will assist in the development and modernisation of her economy, and especially of her industries. Here, fuel research will have an important part to play.

### The Task Ahead

THE new Institute will be faced with two fundamental issues; first, to secure the most efficient utilisation of available resources; and, secondly, to investigate the utilisation of by-products and the production of synthetic fuels. Low-temperature carbonisation is of particular importance, because India's vast coal reserves are mostly non-caking. Tar, a valuable by-product of low-temperature carbonisation, will become essential in carrying out road construction programmes. Furthermore, olefinic gases resulting from this process may well become a basis for the production of innumerable synthetic organic chemicals, in the same way as petroleum gases in the United States. Certain particularities of Indian coal demand research in other directions, for they are often characterised by a high ash content, while other coals contain high percentages both of sulphur and of moisture. The valuable work done in Russia in utilising similar coal in steam boilers should encourage research, pure and applied. Moreover, liquid fuels for internal combustion engines will, as the motorisation of the great sub-continent proceeds, assume special importance, and investigations on the use of vegetable oils in diesel engines will form an integral part of the Institute's programme. Research on producer gas engines and producer gas fuels should also be given adequate attention.

### Science and the Public

IT is surely significant that in a recent issue of *The Times* two advertisements of essentially chemical interest should have appeared on one and the same page—one depicting an experiment in progress in a laboratory, the other showing a "genealogical tree" of the vitamins, a conventionalised version of a type of diagram familiar to chemists, but less so to the lay public. Further on in the same issue was a Doris Zink-eisen impression of a chemist and his apparatus in action—one of the series of I.C.I. advertisements drawing the public's attention to the work which scientists are doing on their behalf. It is only a few months since Dr. Armstrong said that science was still viewed with suspicion by a large proportion of the general public. His remarks were true then; we make no doubt that they are still true to-day; but there are signs—hopeful signs—that this attitude of suspicion is being slowly but surely disposed of, that the mountain of distrust is being gradually determined.

### A Blow to Mumbo-Jumbo

IT may be that the readers of *The Times* do not represent the type of public to which Dr. Armstrong is referring; but we have no reason to suppose that *The Times* has a monopoly of scientific advertisement. If it has, firms engaged in scientific industry have less commercial acumen than we have always given them credit for. In fact, of course, the exact opposite is true: scientific industry is extending its publicity more widely every day, greatly to the benefit of the industry. The public is becoming ever more widely informed and losing its distrust of genuine science; and—a happy corollary—we see less and less of the pseudo-scientific advertisement which seeks to stagger the multitude by the employment of jargon and mumbo-jumbo—the type that was so skilfully parodied in an "advertisement" for "calcined protium" which appeared in the competition pages of a weekly journal some years ago. The author (who, we believe, was an extremely learned professor) far excelled the professional script-writers on wrapping up a few simple facts in elaborate—and strictly accurate—technical terms.

# Application of Alkaline Silicates

## The Cleaning of Solid Surfaces

by P. D. LIDDARD, B.Sc., F.R.I.C.

IT might well be asked "What interest can there be in such a subject as the application of silicates to cleaning?" At first it sounds rather dull and it might seem that any observations on the subject would add very little to our knowledge of chemistry and might be of little industrial use; but it is hoped that these notes will cause others to find interest in what may be an unusual, but nevertheless, absorbing subject. The silicates have different properties from those which might first be predicted and anything which does not appear to obey anticipated laws is surely interesting. Their industrial application is likewise important; and they are cheap, being home produced products. Yet very little thought has been given in the past in this country to the alkaline silicates and the author has taken it upon himself to add a contribution to the previous meagre work.

The sodium salts are obviously to be considered in preference to the potassium and lithium compounds. The silicates of rubidium and caesium have been made but are obviously chemical curiosities rather than of useful compounds. Potassium silicates have been used, as have those of lithium, but again in view of the comparative shortage of potassium and lithium salts compared with those of sodium, consideration of cost must be borne in mind when applying these materials to cleaning problems. In a cleaning operation much material is wasted when coming into direct contact with the surface to be cleaned and for this it is essential that the cost of the products used must be low.

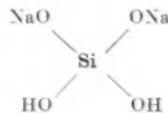
### Structure of Alkaline Silicates

The basic form of orthosilicate may be regarded as that from which the other alkaline silicates are derived. In the past sodium metasilicate, in which silica and sodium oxide are combined in equivalent proportions, has been regarded as the most stable silicate. In the other silicates the proportion of  $\text{Na}_2\text{O}$  to  $\text{SiO}_3$  may be increased or decreased around this 1:1 relationship, giving products which are less or more siliceous respectively. The latter do not appear to form definite chemical compounds, although the possible structure of some crystalline materials of this character can readily be formulated. Nevertheless, the stable products available are most probably in the nature of mixtures of  $\text{SiO}_4$  and  $\text{Na}_2\text{O}$ , and it is most likely that they are made up of definite networks of silica molecules with  $\text{Na}_2\text{O}$  molecules in the inter-spaces.

This structure would be similar to the

constitution of glasses as shown by spectrographical analysis. These more siliceous silicates of the alkali metals are liquids and it is not until we come to sodium metasilicate that a crystalline structure is shown.

Sodium metasilicate was first made available commercially in 1930. Harman's<sup>1</sup> work on the conductivity of alkaline solutions established its presence beyond all doubt. It can be obtained in the form of a series of hydrates containing 5, 6, 8 and 9 molecules of water. Prolonged heating at 100°C. dehydrates these compounds to about 1.5 molecules of water. The existence of the anhydrous material has been claimed, but is extremely difficult to establish and it is possible that when produced it has a chemical structure different from that of its hydrates. If we accept the basic formula of  $\text{Na}_2\text{SiO}_4$  for sodium metasilicate, it can be shown that the simplest formula will be a cyclic one— $\text{Na}_2\text{Si}_2\text{O}_5$ . Alternatively, if a stable form, having one molecule of water, is considered, this can have a simpler formula as follows:



This formula will be that of a di-sodium salt of orthosilicic acid.

Orthosilicic acid may be regarded as the stable form in solution of these silicates and the one from which the others are derived. The acid salt, with the empirical formula  $\text{NaHSiO}_3$ , is known in solution, and this can be considered as a mono-sodium salt of orthosilicic acid. We can take this a stage further. Sodium sesquisilicate was first produced commercially in 1934. It has the empirical formula  $\text{Na}_2\text{Si}_2\text{O}_5$  or more simply  $3\text{Na}_2\text{O} \cdot 2\text{SiO}_2$ . If we consider a semi-hydrate of this we have the compound  $\text{Na}_2\text{HSiO}_4$ —in other words, the tri-sodium salt of orthosilicic acid. The tetra-sodium salt, known as sodium orthosilicate, was first put on the market in 1935. Again, it has been established as a definite compound and would form the final stage of neutralisation of orthosilicic acid if the above views were accepted. Evidence that this is the stable silicate in solution will be put forward at a later stage, but the fact that any of them may be obtained from sodium metasilicate and caustic soda in solution and crystallised out supports the view. Also, these arguments might also account for the fact that the existence of simple chemical compounds

with a ratio of  $\text{SiO}_2$  to  $\text{Na}_2\text{O}$  greater than 1 : 1 has not been proved.

On the other hand, claims have been made for compounds containing a greater proportion of  $\text{Na}_2\text{O}$  to  $\text{SiO}_2$  than the 2 : 1 required by orthosilicate. Within recent years, a claim has been made for products between orthosilicate and one having the empirical formula  $\text{Na}_{46}\text{SiO}_{22}$ . Some of these appear to give values similar to mixtures of sodium orthosilicate with an appropriate excess of caustic soda.

### Manufacture

Before passing to the properties of these silicates, brief consideration will be given of the method of manufacture of these materials. In general they are produced commercially from the two compounds: silica and soda ash. Caustic soda is sometimes used in place of soda ash, more particularly when the higher silicates are to be prepared. The two are mixed in a furnace and, in modern plant, this latter is electrically heated. A temperature approaching 1500°C. may be required. Carbon dioxide, given off from the melt in this furnace, passes off in the flues, but the heat exchange principle can be applied, thus economising on the heat which would otherwise be lost by the passage of this gas into the atmosphere. The molten silicate is mixed with hot water in a dissolver. If

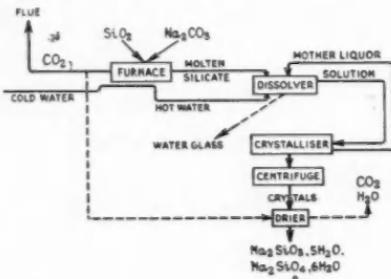


Fig. 1. Flow-sheet of the manufacture of alkaline silicates.

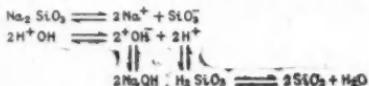
water-glass is required, it will be obtained at this stage.

Under the term "water-glass" we can include such commercial products as those containing  $\text{SiO}_2\text{-Na}_2\text{O}$  in the proportions of 2 : 1, 3.3 : 1, etc. In the case of the more alkaline silicates, the solution from the dissolver is passed to the crystalliser. The crystals produced can be centrifuged, the mother liquor being passed back to the dissolver. The crystals go to a drier which may be heated by the flue gases from the furnace. From this drier the various hydrates of the alkaline silicates required are obtained. The proportion of water in

the silicates can be varied either by heating or by crystallisation from solutions containing high proportions of free caustic soda. Thus, a solution containing 10.5 gm. of sodium metasilicate, 54.5 gm. of water and 40 gm. of caustic soda will give crystals containing  $9\text{H}_2\text{O}$ . With 60 per cent. of caustic soda, crystals with  $6\text{H}_2\text{O}$  are obtained.

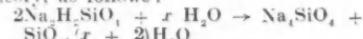
### Alkaline Silicate Solutions

Alkaline silicates in solution may exist in true solution or in colloidal suspension. Those products, which form definite compounds, i.e., with a  $\text{Na}_2\text{O}/\text{SiO}_2$  ratio of one and upwards to one and possibly 1 : 2, exist under normal conditions in true solution, dissociating in dilute solutions to give positively charged sodium ions and negatively charged silicate ions. The silicate ions may be  $\text{SiO}_4^{4-}$  as in the case of orthosilicate, or  $\text{HSiO}_4^{3-}$ ,  $\text{H}_2\text{SiO}_4^{2-}$  and  $\text{H}_3\text{SiO}_4^{1-}$  in the case of the other known silicates, if the stable orthosilicate structure previously suggested is accepted. Otherwise, one would postulate the anions as  $\text{Si}_2\text{O}_5^{6-}$ ,  $\text{SiO}_5^{5-}$ , and  $\text{HSiO}_5^{4-}$  for the sesquisilicate, metasilicate, and "acid" metasilicate respectively. Harman<sup>2</sup> claims that the hydrolysis of these compounds in solution is small at low concentrations, but in detergency the concentrations might be considered as fairly high, ranging between  $N$  and  $N/10$  approximately. The hydrolysis when it occurs might be represented as follows, in the case of sodium metasilicate :



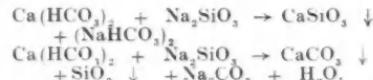
The author is of the opinion that this equilibrium is very easily upset, and when upset it passes over to the hydrolysed state, the silicic acid formed really being present as variably hydrated silica molecules, depending upon the conditions. Now this silica does not readily react with caustic soda and tends to precipitate out in some cases as colloidal silica. Harman<sup>3</sup> has noted the increase in colloidal  $\text{SiO}_2$  in concentrated solution. Alternatively, it may form complex charged micelles with the silicate ions, which may be represented as :  $(\text{SiO}_3)_x \cdot y \text{SiO}_2 \cdot z \text{H}_2\text{O}$ . Conditions under which this may occur include the presence of other alkalis such as sodium hydroxide, sodium carbonate, and sodium phosphates. As evidence of this it was found that of two commercial sodium metasilicates ( $\text{Na}_2\text{SiO}_3 \cdot 5\text{H}_2\text{O}$ , approx.), one having a ratio of  $\text{Na}_2\text{O}/\text{SiO}_2$  of 1 : 0.994 had a clear solution after standing 24 hours, whereas one having a ratio of 1 : 0.861 was somewhat cloudy and tended to form a precipitate rich in silica. It might at first appear surprising that the introduction of alkali into the solution

should upset the stability but it might be explained on the "stable" orthosilicate theory, as follows:



This hydrolysis appears to be promoted by the presence of excess alkali. The hydrated silica, although readily formed, does not readily react with the caustic soda, although it will be to some extent a reversible reaction. That the silica does react with metals has been proved by the build-up of siliceous deposits on the moving iron parts in washing plant using sodium metasilicate, especially when extra alkali has been added. It is to be expected that acids will upset the equilibrium and they, of course, tend to precipitate hydrated silica. Again, complex charged micelles are often produced and Gordon<sup>4</sup> has found that the charge on these changes to positive around pH 2. Commercial sodium sesquisilicate solutions examined were cloudy, and this may be due to conversion to stable orthosilicates.

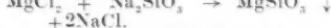
Among the more siliceous silicates, those which do not appear to be definite compounds are usually colloidal solutions, and have lower conductivities than the more alkaline products. Ganguly<sup>5</sup> has observed a rapid increase in the number of particles visible by the ultra-microscope in ratios of 1:3 and above. The conductivity of concentrated solutions of silicates was pointed



Again, with an excess of  $\text{CO}_2$  in the water, silica will be precipitated:



With waters containing salts giving rise to permanent hardness, precipitation will occur:



These silicates are often colloidal and may have silica associated with their particles. Where there is an excess of silica (as, for example, where an excess of "aggressive"  $\text{CO}_2$  is met with in solution), the precipitates may be hard and scale-forming. As will be seen later, the formation of colloidal precipitates with hard waters and alkaline silicates is a useful factor in detergency.

The method of making up the solution in a hard water has an important bearing on the class and amount of the deposit produced. A typical commercial sample of sodium metasilicates was taken and a 1 per cent. solution of it made up in London tap-water under different conditions. The varying characteristics are listed in Table I and the appearance of the solutions formed after standing 24 hours is also given.

#### Method of making

#### General liquid

Method of making	General liquid	Floating matter	Deposit	Shaking and allowing to settle
Addition of silicate to cold water without heating	Clear	Very slight	Few flakes of floc	Cloudy liquid with fine particles
Addition of cold water to silicate without heating	Clear	Considerable	Considerable	Large amount of floc—settles rapidly
Addition of the silicate to cold water then heating to 85°C.	Very cloudy	Very slight	Medium compact floc	Very cloudy liquid; will give particles
Addition of cold water to the silicate then heating to 85°C.	Cloudy	Small amount of floc	Little floc	Cloudy liquid with large masses of floc
Addition of silicate to water at 85°C.	Clear	Very slight	Flaky	Cloudy even liquid with very fine particles
Addition of water at 85°C. to silicate	Clear	Nil	Considerable compact floc	Cloudy even liquid with very fine particles

out as being poor by Kohlrausch<sup>6</sup> as long ago as 1893. More modern measurements of equivalent conductivity by Harman<sup>1</sup> show that for the crystalline silicates the values increase towards the orthosilicate formula. He is of the opinion that for ratios greater than 1:2, micelle formation occurs, and it would be expected that these would considerably lower the conductivity. This has been confirmed by the author.

#### Solutions in Hard Water

So far consideration has only been given to solutions in pure water; but it is necessary to consider in detergency the solutions of these silicates in hard waters. Here reaction will occur with the calcium bicarbonate present in most of these waters. Among the products usually precipitated out are mixtures of calcium silicates, calcium carbonate, and silica. The following equations represent this:

#### Alkalinity of Solutions

An examination has been made of the alkalinity of solutions of alkali metal silicates and of their buffering effect. On the whole, as is to be expected, they have lower pH values than equivalent solutions of caustic soda. They rely for their alkalinity upon the free hydroxyl ions produced in solution, by hydrolysis, being the salts of very weak acids and a strong base. Typical examples of pH values for N/100 solution of commercial silicates as recorded on one instrument are given in Table II.

Silicate	$\text{Na}_2\text{O}$	$\text{SiO}_2$	$\text{Na}_2\text{O}/\text{SiO}_2$	pH	N/100 ratio	solutions
Liquid Silicate A	8.45%	27.67%	1:3.27	9.14	1:2.16	10.58
	18.41%	39.77%				
Metasilicate A	30.55%	26.32%	1:0.86	11.32	1:0.99	11.30
	28.54%	28.38%				
Sesquisilicate	34.50%	24.47%	1:0.61	11.77	1:0.48	11.37
	37.99%	18.35%				

These solutions contain the same weight

of  $\text{Na}_2\text{O}$  in a given volume, and the lower  $\text{pH}$  values of the more siliceous materials are indicative of better buffering solutions. Silicates do form good buffering solutions in alkaline detergents and thus provide a means of economy in detergent consumption. The alkali required for cleaning purposes may be all present as "active" alkali, as, for example, in the case of caustic soda solutions, where the  $\text{pH}$  value will be high, it being almost completely ionised; approaching neutralisation, there is a rapid fall in  $\text{pH}$ . With buffered alkalis, the free hydroxyl ions are only released as required from the main reservoir of unionised molecules in the solution. Since it is the hydroxyl ion which is largely used up in cleaning processes of this kind, the fall will be gradual, with a steady release of silicate ions, or of micelles of silicate ions with hydrated silica molecules. These, being charged bodies, play a very important part in the deflocculating of solid residues, resulting in colloidal suspension. The important thing here is that the reaction is reversible, and as  $\text{OH}$  ions are removed, so more will be forthcoming from the hydrolysis of the silicate.

The buffering of silicates is illustrated in Fig. 2. The fall in  $\text{pH}$  is plotted against the volume of decinormal acid added, around neutralisation point. The buffer index can be taken in this case as the volume of decinormal acid to bring about a fall in  $\text{pH}$  from 8.75 to 8.25. The average of 8.5 is approximately the division between "active" and "inactive" alkali in detergent solution and roughly corresponds to the lower limit of the phenolphthalein endpoint. The following are the buffer index values obtained from the graph on this basis:

Caustic soda	...	...	...	0.025
Sodium orthosilicate	...	...	...	0.05
Sodium metasilicate	...	...	...	0.1
Silicate ( $\text{SiO}_2 : \text{Na}_2\text{O} = 2 : 1$ )	...	...	...	0.4
Silicate ( $\text{SiO}_2 : \text{Na}_2\text{O} = 3.3 : 1$ )	...	...	...	0.75

It will be seen that there is a slower change or, putting it another way, more resistance to change in alkalinity, with rise in the silica content of the silicates. This is a point in favour of the more siliceous silicates for use as detergents.

#### Surface-Active Properties

The alkalinity of a material is far from being the main criterion of its power of detergency. In fact the surface active properties of solutions of the material are those which decide whether or not it is suitable for washing purposes. These surface-active properties include surface and interfacial tensions and adsorption. Wetting of surfaces, emulsification of other liquids, and deflocculation of solids are secondary factors resulting from the primary condition of the internal forces of the solution. Thus the lower the surface tension of a given

solution, the more easily will it displace air from crevices, and penetrate into a deposit; the lower the interfacial tension between the solution and another liquid, say an oil, the more readily will it wet and emulsify that oil.

In this respect silicates are unique among the commoner alkalis. They can, under some conditions, act more like soap solutions, and this may be connected with micelle formation. Certainly, they usually have lower surface and interfacial tensions than other common alkalis in equivalent solution.

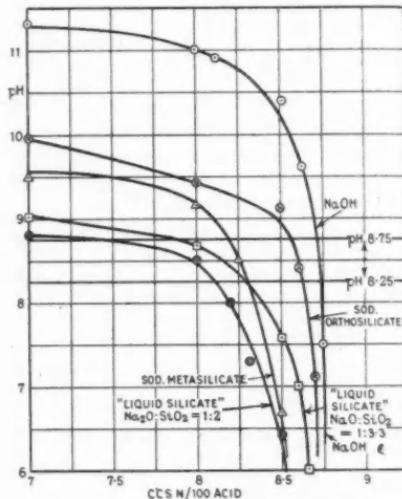


Fig. 2. Buffering of silicates.

The wetting of a wax deposit by alkaline solutions has been studied and the contact angles measured. These are given in the following table for solutions of the alkalis (equivalent to 1 per cent.  $\text{Na}_2\text{O}$ ) against a paraffin wax surface at  $18^\circ\text{C}$ . The value given is the advancing one:

Akali	θA
Liquid silicate 3.3 : 1	...
Liquid silicate 2 : 1	...
Sodium metasilicate	54.0
Sodium sesquisilicate	54.5
Sodium orthosilicate	55.5
Trisodium phosphate	70.0
Sodium carbonate	102.0
Sodium hydroxide	104.0

It will be noted that the crystalline silicates have a fairly constant value around  $55^\circ$ . If they are, in fact, orthosilicates when in solution, this close value for all forms might be expected. The "liquid" silicates, on the other hand, have lower values, and it is known that the value becomes lower with increase in the  $\text{SiO}_2$  content.

(To be continued)

# New Filter Equipment\*

## An American Development

**I**N producing vanadium, the U.S. Vanadium Corp. was faced with the problem of separating a sodium vanadate solution quickly from sand containing such a wide range of particles that orthodox filtration methods had been found unsatisfactory. As the use of percolation tanks complicated the flow-sheet, a final solution was found in a new filter design, the main feature of which is the use of two drums, like a double-drum dryer, thus eliminating the feed tanks, representing an entirely new approach to the mechanical design of filtration apparatus.

Developed originally as a solution to a troublesome problem in the company's sand leaching plant at Uravan, Colo., this new filter appears to have considerable application in the processing industries, for it handles a range of particle sizes formerly thought impossible to treat by vacuum filtration, without prior classification.

The vanadium ore, in the treatment of which this filter was developed, consists predominantly of a sandstone containing about 2 per cent. vanadium, generally in the form of a vanadium-bearing mica and carnotite. That part of the vanadium recovery process with which the new filter is connected is indicated in the flow-sheet (Fig. 1), which outlines the method before and after installation of the filter.

Briefly, the method consists in crushing the sandstone to minus-10 mesh in size, roasting it with sodium chloride, quenching the calcine in water in order to dissolve the sodium vanadate formed in the roasting, and separating the liquor from the sand. The clarified liquor goes to a precipitation plant, and the sand goes to an acid leaching plant for further treatment.

### Difficulties of the Process

The difficulty with the process, as originally developed, was that if the liquor in which the calcine is quenched is allowed long contact with the calcine, the resultant cooling causes a portion of the dissolved vanadium salts to re-precipitate. A rapid separation, including adequate washing of the sand and the liquor, is therefore desirable, yet no sort of vacuum filtration, the more obvious method, had been successful in accomplishing it. This is due to three factors: first, the wide range in particle size of the sand, which is minus-10 mesh to 7 per cent. minus-200 mesh; second, the rapid settling rate of the coarse fractions; third, the existence of sufficient slow-settling slime to form a definite slime zone in any reservoir containing the sand. It is unnecessary to grind the

sand finer in order to get a satisfactory recovery of vanadium in leaching it, and, furthermore, it would be too costly to grind the sand fine merely on account of the inadequacy of filtration equipment.

In a drum filter, for example, no amount of agitation in the reservoir could maintain

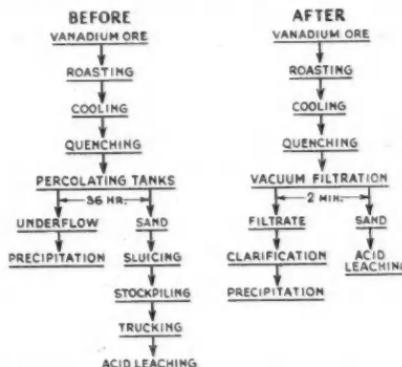


Fig. 1. Simplification of flow-sheet as a result of using Syncro-Drum filter.

a homogeneous pulp, and the filter medium entering the reservoir had, therefore, to pass first through a slime zone before reaching the main pulp zone. Even with back pressure of air at this point, the resultant coating of this slime was enough to inhibit proper cake formation of the coarser particles. Disc filters and internally-fed drum filters were subject to the same difficulty.

A top-feed, single-drum filter was also tried, and here the size segregation of the feed was less important. A new difficulty entered, however, in that, lacking a feed reservoir, the density of the feed to the top of the drum had to be such that the mother liquor displaced in forming a cake, plus the moisture remaining in the cake, must equal the percentage of liquid in the feed. If an increasingly dilute pulp were fed, for example, the mixture might overflow, contaminating the cake already filtered. Increasing the rate of filtration by using media of greater porosity, to allow a margin of safety, resulted in a filtrate containing 4 or 5 per cent. solids, which made subsequent clarification a major problem. In addition, adjusting the rate of feed to the gradually decreasing filter rate, as medium pores became blinded, was difficult to accomplish. Lacking a better solution, the company's practice had been to use a system of sand leaching percolation tanks, from which the sands

\* Abridged from an article by R. H. Ramsey in *Chem. Met. Eng.*, 1944, 51, 7, p. 109.

were eventually sluiced for drainage, after a 36-hour treatment. The sand had then to be reclaimed and shipped to the acid leaching plant.

In conjunction with the company's engineers, the problem was tackled by Peterson Filters & Engineering Co., of Salt Lake City, Utah, with the idea of developing a filter in which the medium would strike the coarse sand before it met the slime zone, but in which close regulation of feed rate and density was not required. After lengthy experiments, the Syncro-Drum filter was developed which meets these requirements. Fig. 2 shows the elements of the new filter.

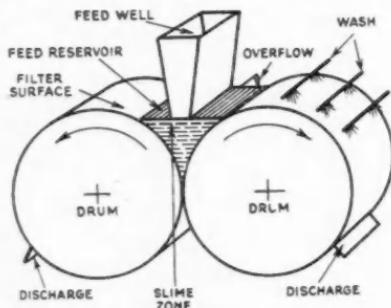


Fig. 2. Elements of the Syncro-Drum filter, showing double drum, feed reservoir, feed well, wash sprays, and scrapers.

The reservoir is confined above the two drums, but a control overflow back into the preceding circuit accommodates any surges in feed and automatically compensates for increasing resistance in the filter medium. The medium enters the slime zone last, and the cake of coarser particles, which forms on the medium first, tends to keep the slime away from the cloth. The result is a much more permeable cake than would be the case if slime were next to the medium and sand were above it. The filtration is so rapid that the cake can be washed by three sprays before it is discharged with a moisture content of 17 per cent. A belt conveyor delivers the sand to the leaching plant, as the conveyor eliminates the operations of sluicing, draining, and reclaiming.

#### Other Applications

Study of the Syncro-Drum shows that it possesses certain features other than the obvious mechanical ones, thus filling up a gap in filtration equipment. In the matter of size of feed, the Syncro-Drum can take particles of up to 0.4 in. in size, above which the drainage-type filters operate, and down to minus-48 mesh, below which the drum and disc filters are used.

The Syncro-Drum also handles a wide

range of pulp densities running from about 20 to 70 per cent, solids, from thickener feed almost up to material suitable for a drier. This range is made possible by the over-drum feeding, the reservoir, and the overflow return. It is the first filter to deal successfully with material in the size range of minus 0.4 in. to plus 48 mesh at a vacuum of from 5 to 24 in. of mercury.

In considering further applications for this filter, therefore, it is likely that it will find its greatest usefulness in those processes involving the handling of products of a wide range of particle size. In ore treatment, these will be found where grinding to extremely fine sizes is not required in order to release the valuable mineral from its surrounding waste rock. Dewatering wastes for disposal and concentrates for further treatment are uses that suggest themselves. These will become more common as separation processes of the heavy-media type come into more general use, especially as such separations are usually made at a coarse size. In coal preparation plants, there are many applications for the Syncro-Drum in dewatering usable fines and disposing of wastes.

The development of this filter is a concrete example of what can be accomplished by the combined efforts of the designer and the operator. Its possibilities could only have been discovered by experimenting with the filter on a commercial scale.

## Institute of Fuel

### Yorkshire Section

THE Yorkshire section of the Institute of Fuel was inaugurated on September 21 at Leeds. At a luncheon at the Great Northern Hotel, Sir Hubert Houldsworth, K.C., Controller-General, Ministry of Fuel and Power, spoke of the acute fuel problems which could be expected after the war. Addresses were also given by Dr. E. W. Smith, president of the Institute; by Col. W. A. Eristow, the vice-president; by Mr. B. Mowat Jones, vice-chancellor of Leeds University; and by Judge W. Stewart, regional fuel controller. Later, at a meeting of the section held at Leeds University, the new chairman, Professor D. T. A. Townend, Livesey Professor of Coal Gas and Fuel Industries, declared that fuel supplies would be the basis of our survival after the war, let alone our prosperity, and asked that competitive interests should collaborate in peace as they had in war. Dr. Smith urged that education in the use of fuel should begin in the elementary schools; and Sir Hubert Houldsworth stressed the part that the Institute could play in contributing to the better arrangement of education for this purpose, and in the provision of trained technologists.

# Colchicine Treatment of Jute\*

## Research in India

SINCE Blakeslee made his remarkable discovery in 1937, many successful results in inducing polyploidy by colchicine treatment have been recorded. The work has been reviewed by Fyfe (1939) and Dermen (1940), who have also discussed in detail the action and use of colchicine. In India, too, work has been going on in this direction. In 1940, the study of jute was started at the Jute Agricultural Research Laboratories, Dacca. This subject was commented upon in THE CHEMICAL AGE of September 16; the following account should, therefore, be of interest.

Two well-known jute varieties, D 154 (*Corchorus capsularis* L) and Chinsurah Green (*C. olitorius* L), were at first selected for study, but as the latter did not give encouraging results it was dropped. In 1940, selected dry seeds of both varieties were immersed in 0.4, 0.6, 0.8, and 1.0 per cent. aqueous colchicine solutions for 6, 12, 24, and 36 hours in each case, the number of treatments for each variety being sixteen. To study the effect of pre-soaking, a few seeds of each were first soaked in water for 30 hours and then for 12 hours in 1.0 per cent. colchicine solution. The seeds were sown in pots.

In 1942 seeds as well as growing terminal shoots of D 154 were subjected to colchicine treatment as follows: Seeds were first soaked in water for 18 hours and then in 0.05, 0.1, 0.5, and 1.0 per cent. aqueous colchicine solution for 12 and 24 hours, the number of treatments being eight. The same treatment was repeated, but without any pre-soaking in water. As regards growing shoots, 0.05, 0.75, 0.10, 0.15, and 0.20 per cent. aqueous colchicine solution was applied three times on terminal buds of six-weeks-old vigorously growing plants. Observations on vegetable characters were taken for detecting cases of polyploidy. Acetocarmine smears of leaf-tips (Baldwin, 1940) were made at different stages to determine the stomatal number of chromosomes.

### Effect of Treatment

Seed treatment with various concentrations of colchicine was found to have a marked effect on germination. Germination was considerably checked especially in the higher concentrations, only a few plants coming out successfully. In the lower concentrations the general swelling of the hypocotyl and the radicle was more prominent than in the heavier concentrations, where growth was more effectively checked. In the preliminary studies carried out in 1940, most of the surviving plants from the treated seeds showed no morphological differences from the controls. Only one D 154 plant obtained from

seed treated in 1 per cent. colchicine solution for 12 hours, after 30 hours pre-soaking in water, seemed to have responded to colchicine treatment. Its leaves were rough and rounded as compared with the control, and the flowers much bigger. The capsules were about double the normal size and contained only three seeds per locule.

Of the 18 mature plants obtained from the treated seeds in the 1942 experiment, only two were markedly different in appearance from the control, and showed characteristics indicating possible cases of polyploidy. Both were from seeds treated in 0.1 per cent. colchicine for 24 hours without pre-soaking. In these plants the stem and petiole were stouter and better developed and the leaves were much thicker, coarser, and broader than in plants raised from untreated seeds. The flowers, too, were much bigger, and the pollen grains averaged  $45.08\mu$  in diameter, as compared to  $29.81\mu$  in normal flowers. The capsules in both cases were strikingly different in appearance from the normal ones. They were about 1.5 to 2 times the normal size with a thick and fleshy pericarp. The outer surface was comparatively smooth without any sharp protruberances as in normal ones, and the capsules contained only a few good seeds.

A cytological examination of these two plants showed that a doubling of chromosomes had occurred as a result of colchicine treatment. Associated with this doubling of chromosomes, there was a marked increase in cell size.

### Fibre Characteristics

To find out structural changes associated with colchicine-induced polyploidy, anatomical examination was carried out. Both petiole and stem were examined, and it was observed that the larger size and the stouter appearance of these organs in tetraploids, was due to increase in size of the cells rather than to an increase in their number. The number of fibre bundles was the same, but the bundles appeared larger, the individual fibres showing a large lumen in cross section. In macerated material, the length of the ultimate fibres in the tetraploids was found to be about the same as in normal plants but the fibre width was more. This is of great economic importance, for the quality of jute depends primarily upon the nature of the ultimate fibres. The lumen was very large—almost twice that in normal plants, but the thickness of the wall remained the same.

Indian scientists will cordially welcome the Rockefeller grant of Rs. 16,000 annually to the National Institute of Sciences for financial assistance in scientific publications by the different scientific societies of India.

\* Abridged from an article by K. R. Rao, A. T. Sanyal and J. Datta, (Jute Agricultural Research Laboratory, Dacca), in *Science and Culture*, 1944, 10, 2, p. 86.

# Edinburgh's Chemical Industries

## Their Past, Present and Future

AS was briefly indicated in our issue of September 16, a large portion of the *Journal of the Edinburgh Chamber of Commerce* for August was devoted to a review of the chemical industry in Edinburgh and its neighbourhood. The honorary editor of the issue was Dr. James Sandilands, Ph.D., A.H.W.C., F.R.I.C., F.R.S.E., acting head of the chemistry department of the Heriot Watt College, to whom we are indebted for the opportunity of studying the journal at leisure.

As Dr. Sandilands remarks in his foreword, the name "Modern Athens" applied to Edinburgh is apt to make one think of classics rather than manufactures, yet Edinburgh is famous for its crafts of many kinds. The famous Medical Schools—where the use of chloroform was first discovered by Waldie and Simpson—have stimulated the fine chemical industry; the Midlothian paper industry has created a demand for paper-makers' chemicals; and the part played by West Lothian in the development of the world's oil industry is not fully appreciated. Dr. H. B. Nisbet, D.Sc., F.R.I.C., contributes an article on the Education and Training of Technical Chemists, and calls special attention to the courses in both Pure and Applied Chemistry at the University and the Heriot-Watt College.

### Fine Chemicals

Although the fine chemical and pharmaceutical industry of Edinburgh does not employ a great number of people, the number and variety of products manufactured is surprisingly large. Specially important is the manufacture of vegetable alkaloids and of chloroform, and an interesting side line is the production of sterilised surgical gut, one Edinburgh firm alone turning out 2500 miles of "catgut" annually. War conditions have affected the fine chemical industry seriously, and recent years have been a period of hard work in the face of increasing difficulty. The future demands that serious consideration be given to the question of further research into new products, although the established materials are still in great demand despite the threats of new products which may supersede them.

### Paper Making

The paper mills of Southern Scotland have always been known for the high quality of their product, and most of them specialise in high grade writing and printing papers made from esparto grass, some 50,000 tons per annum of esparto papers being the normal output of the mills within ten miles of Edinburgh. The complicated process of

manufacture makes large demands for chemicals, including caustic soda, bleaching materials, china clay, sizing materials, etc. With the entry of Italy into the war, the supply of esparto was cut off, and since then a considerable tonnage of surprisingly good class paper has been made from straw and from waste wood products such as chippings from woodworking machines and lumber-camp refuse. To deal with these, considerably more boiling-plant capacity has had to be constructed, but the mills are, as a general rule, only able to produce from half to two-thirds of their normal output. The resumption of the import of esparto grass is a prime necessity for after the war, for from the esparto paper industry, as represented by the Edinburgh paper mills, this country turns out a product which is not commercially produced, either in quality or quantity, elsewhere in the world.

### Mineral Oil

The Lothian mineral-oil industry arose from the discovery in the 1840's that a certain kind of coal—the so-called Boghead Parrot Coal or Torbanehill Mineral—mined rather desultorily near Bathgate, West Lothian, was the finest thing yet discovered for making coal-gas. A sample of this came into the hands of James Young, a student of chemistry from Glasgow then employed at a Manchester chemical works. Young had been interesting himself in various occurrences of natural mineral oil in several parts of England with a view to establishing a substantial industry, but had found them all unpromising. He had also experimented with cannel coal, but the Boghead mineral gave him exactly what he wanted, and a year or so afterwards a factory to turn this mineral into oil was established at Bathgate, entitled the Bathgate Chemical Works. The one thin seam of Boghead coal gave out after yielding about 250,000 tons; but in the meantime it had been discovered that oil could be won from the bituminous shale in the district just to the east of Bathgate, and since then many million tons of shale have been mined and distilled in the Lothians, as the great red spoil-heaps testify. The oil-shale mining industry has had its ups and downs, and its products were finally overshadowed by the discovery of natural petroleum in America, but they have not been without their importance in the present war. An interesting historical item provided by Dr. Sandilands may be added as a footnote; a balance that belonged to James Young, the oil pioneer, is preserved in the chemistry department of the Heriot-Watt College.

# Sulphur from Coke-Oven Gas\*

## Removal and Recovery at a Ford Plant

**R**EMOVAL of sulphur compounds from coke-oven gas at the great Rouge plant of the Ford Motor Company at Dearborn, Mich., always a serious problem, reached a climax about two years ago. Up to that time it had been necessary to remove sulphur compounds from about 12 million cu. ft. of gas per day for use in the plant; but then, with the installation of a magnesium smelter and the construction of an armour-plate building, about 10 million extra cu. ft. per day of sulphur-free coke-oven gas were required to reduce corrosion on the heat-treating furnaces. Instead of installing additional iron oxide boxes to handle the increased requirements, it proved cheaper to put in a single Thylox absorption system to purify the total volume of gas coming from the coke ovens, approximately 54 million cu. ft. per day. The iron oxide boxes are still in use in some parts of the plant where extra care must be taken to eliminate all traces of sulphur products in the gas. An outstanding feature of the Thylox process is that the sulphur is recovered in elemental form. This eliminates the difficulty of getting rid of hydrogen sulphide and provides a usable by-product. At present, in the Ford plant, approximately 6 tons per day of 99 per cent. pure sulphur are recovered.

### Uses for Recovered Sulphur

Although this recovery is incidental to purification of the coke-oven gas, it is of importance because of the finely divided state of the sulphur as it is recovered. In colloidal form, it is considerably more valuable than ordinary sulphur as it can be utilised in the manufacture of fungicide powder. There is, of course, the difficulty of drying the sulphur without melting it, but it can be used in paste form for certain insecticides. Pending solution of this problem, most of the sulphur from the Rouge plant has been consumed in sulphite pulp and paper mills in the preparation of cooking liquor. Since there is some arsenic in the recovered sulphur it probably cannot be used in the manufacture of sulphuric acid for general use, although in many cases a trace of arsenic would not be objectionable.

Coke-oven gas entering the Thylox unit has come through the main from the coke ovens, passes through a scrubber for tar removal, a primary gas cooler, and Cottrell electric tar precipitators, and finally goes to the sulphate saturators for removal of am-

monia. Thus the gas is practically free from tar and ammonia, and does not cause excessive trouble in the absorption equipment.

### The Thylox System

The system is based on the absorption of hydrogen sulphide and other organic sulphur compounds in a solution of sodium thiosulfate, subsequent air oxidation of the resulting solution freeing the sulphur and leaving an active solution for further absorption.

Before entering the absorbers, of which there are two in parallel, the gas is cooled to about 21-24° C., in order to increase the efficiency of the absorbers. Steel tank coolers 45 ft. high and equipped with wood hurdles are used for cooling the gas. Water is sprayed into the cooler at a temperature of about 21° C., and all wash water is run off to the naphthalene pit for possible recovery of naphthalene. The gases cooled by this means pass directly into the absorbers which are somewhat larger tanks, 90 ft. high and 20 ft. in diameter, also equipped with wood slat platforms. Here the gases pass upward countercurrent to activated Thylox solution which is sprayed over the wood hurdles. When the gas leaves the absorbers, and returns to the plant mains, it is at a temperature of about 38° C. and approximately 98 per cent. free of sulphur compounds. If further purification is required, the gas may be passed through iron oxide boxes. In order to obtain optimum absorption conditions, it has been found necessary to maintain the proper pH value by adding small amounts of soda ash to the solution. There is also a certain amount of make-up required owing to losses in the system such as leaks, evaporation and extraneous chemical reactions.

### Recycling

Passing from the absorbers, the solution which has picked up the sulphur compounds is transferred to the oxidising unit, where it is reactivated and sent back to the absorption system. To do this, there are two 125-h.p. motor-driven centrifugal pumps each of which is capable of handling 150,000 gal. per hour. In addition, a third pump is maintained as a stand-by. Since operation began, it has been found advantageous to by-pass approximately 25 per cent. of the foul solution directly to the absorber. All the foul solution is pumped through a heater in the pump discharge line where its temperature is raised to about 38° C. by means of superheated coils.

A steel tank raised about 125 ft. off the ground receives the pump discharge and

\* Abridged from an article by N. G. Farquhar in *Chem. Met. Eng.*, 1944, 51, 7, p. 94.

feeds the rest of the system by gravity. From this feed tank, the foul solution is led into the bottom of a primary thioniser, rises to the top, and is then led into the bottom of a secondary thioniser. Solution overflowing the top of the secondary thioniser has been completely reactivated and is run off to a weir box just above the absorbers. Here the reactivated solution is mixed with the 25 per cent. of the foul solution which was by-passed. It is then fed through a seal to a distributor ring on top of the absorbers which distributes it through spray nozzles.

Action in the thionisers consists simply of air oxidation. A battery of air compressors is in continual operation supplying air to the thionisers at the rate of 200 cu. ft. per min. As this air bubbles up the absorbed sulphur compounds are oxidised and the freed sulphur lifted to the surface, where it forms a froth. As this froth builds up, it spills slowly over into a trough which in turn directs it to a slurry tank where it is agitated and stored for further processing.

The first step in the recovery of the sulphur is to filter it on a standard rotary filter. A cake approximately  $\frac{1}{4}$  in. thick is formed on the trough and then dropped into a stainless steel-clad autoclave which is steam jacketed. The filtrate from the operation is returned to the absorption solution system.

Steam at  $115^{\circ}$  C. is used in the autoclave and results in the melting of the sulphur which separates to the bottom half of the autoclave, leaving the scum and impurities on the top. Having been thus separated from the water and other impurities, the sulphur may be drained into a cast-iron mould and allowed to solidify, or processed by a newer method developed at the Ford plant. In either case, the impurities are blown off to a steel tank to be re-worked.

#### The Cooling System

In the newly-developed system, the molten sulphur is blown to an agitated steel tank where it is kept in a molten state. This tank also acts as a feed tank for a stainless steel belt about  $1/16$  in. thick, 2 ft. wide and about 75 ft. long. The molten sulphur is allowed to flow freely from a 2-in. pipe on to the belt where it forms a cake about  $1/16$  in. thick and 2 ft. wide. As the sulphur travels along, it is cooled through the belt by a series of water sprays playing on the underside of the conveyor. Before the sulphur has reached the end of the belt travel, it has thoroughly solidified and cracks off as the steel bends to go round the pulley. The sulphur in this form is readily handled in a hopper bin from which it can be distributed either for direct packaging, grinding or further processing.

While this Thylox process is referred to

as an absorption process, it is recognised that there is actually a definite chemical reaction taking place in the absorbers. This is why the "desorption" in the thionisers is not simply the liberation of the sulphur compound originally in the coke-oven gas, but rather an actual oxidation of sulphur from chemical combinations in the absorption solution.

#### RUBBER STUDY GROUP

The Ministry of Supply announces that as a result of the exploratory talks on rubber recently held in London, the British Government will participate in an informal rubber study group. This group, composed of representatives of the Governments of the Netherlands, the United Kingdom, and the United States, will meet from time to time to discuss common problems arising from the production, manufacture and use of rubber—crude, synthetic and reclaimed. Studies will be initiated and possible solutions to rubber problems will be considered. However, the group as such will not formulate and transmit recommendations to the participating Governments, although the latter will be kept fully informed of the proceedings of the group through their representatives. Arrangements will be made for other interested Governments to be kept informed of the studies made and the results of the discussions so far as is practicable.

The rubber study group will continue to function during such periods as, in the opinion of each of the participating Governments, it continues to serve the purposes for which it is designed. A first programme of studies is under way on both sides of the Atlantic as a basis for future discussions.

#### BRAZILIAN CHEMICALS

The value of chemicals produced in Brazil has increased by 38 per cent. since 1938. The chemical, pharmaceutical and allied industries rank now fourth among the country's 15 leading industries, as far as the value of output is concerned. In the past two years, the chemical industry has either initiated or greatly expanded the production of more than 125 products. Annual output of sulphuric acid is estimated at about 65,000 tons, compared with 48,000 in 1938. Other important products are caffeine, cellulose for rayon and paper manufacture, glycerin, acetic acid, citric acid, dehydrated castor oil, gunpowder and explosives, quebracho extract, ipecac, drugs and medicines. Production of a number of chemicals used in making insecticides and fungicides has also increased considerably.

## English Oil War-Time Expansion

SOME facts have now been revealed concerning the contribution which English oil production, almost entirely developed since the war, has been making to the war effort, and the way in which it helped to counter the U-boat threat during the most critical period of the struggle. The location of the oilfield remains a closely guarded secret, but it may now be stated that production has increased from 238 tons a month in 1939 to 100,000 tons, or 26 million gallons a year at the present time. Prospecting and drilling have been going on continuously since the closing years of the last war, and received encouragement from the Petroleum (Production) Act of 1934, but the intensification of the effort was due directly to the increasing activity of German submarines in 1941, when the target of 100,000 tons a year was set by Mr. Geoffrey Lloyd, Petroleum Secretary and chairman of the British Oil Control Board. How optimistic that target was may be gauged by the fact that production at the time was just one-quarter of the desired output.

That the outcome was successful was due to the unexampled speed at which the work was carried on. Wells have been completed and put into operation in seven days from the time that drilling started, while the period of moving the heavy drilling machinery from site to site has been reduced to as low as 12 hours. In one instance a complete outfit of portable units was moved and had bored 960 ft. at a new site 24 hours after leaving the previous one. During the war period a total of 78,000,000 gallons has been produced—all of excellent quality and providing the raw material for the manufacture of high-grade petrol lubricants.

### Drilling for Future Output

Scattered over an area of many square miles are 238 productive wells, but the area of the main field (owned and operated by the Anglo-Iranian Oil Company) is about 2 m. by  $\frac{1}{2}$  m., and the oil-bearing strata lie between 2000 ft. and 2500 ft. Meanwhile, deep test drilling is being carried out with a view to testing for a lower horizon; one test borehole has been sunk to over 7000 ft. An interesting feature is that at a small field in another part of the country, production has been obtained from wells sunk only 100 ft. This work on the oilfields has called for the drilling of some 1600 shot-holes covering an area of 1300 sq. miles. Pipelines have been laid to sidings near by from which the oil goes by railway tank cars to the refinery. Many of the 1000 men employed have to travel some distance, from neighbouring communities.

One pleasing feature of the enterprise is

that apart from offices, stores, workshops, and laboratories, few visual evidences of the work exist, and the expected "forest of derricks" is conspicuous by its absence. The 7ft. high oil-pumps are electrically-driven and silent and strike no discordant note in an agricultural landscape. As soon as a well is completed, the machinery is removed and the site levelled. Mr. Lloyd's motto has been "Milk and oil from the same field."

An expert has pointed out, to a special correspondent of *The Times*, that the field would continue to produce oil at a decreasing rate for 10 or 15 years. Meanwhile, explorations are being carried out to widen the productive area.

### LETTER TO THE EDITOR

#### Screw and Propeller Pumps

SIR.—There is a serious omission in the article, "Screw and Propeller Pumps," appearing in THE CHEMICAL AGE issue of September 16. No mention is made of the "Centric Rotary Pump" particularly the "Ellehammer" make of this type.

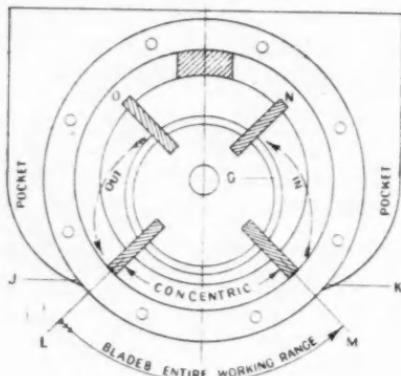
This pump of Danish origin can best be described as a constant differential displacement type and was introduced to this country by the undersigned several years ago as a part of the Mechanical Airfoam Plant for combating aeroplane crash fires, previously referred to in your journal. It is extremely sturdy and simple, and inclusive of the rotor and blades there are only two moving parts; and although the blade guide ring is eccentric the operation is completely concentric. It is self priming, requires no foot valve in the suction pipe, possesses proved efficiency of 76 per cent. and will run in either direction by simply reversing inlet and suction elbows.

The practical maximum suction is 27 ft., but actually in a test as a trailer unit at a R.A.F. Station the actual lift was almost 30 ft. from sea to wharf level and the pump put a jet over the top of the station, the first ever to do so. The makers claim suction 30 ft. head up to 260 ft. The most surprising thing about this pump is that it will lift water from 27 ft. with the vacuum broken to permit the ingress of air and another liquid to produce "Airfoam."

I have operated this pump as a water delivery unit at fires—sucking a mixture of sand and water, so thick that you could almost make bricks of the mixture—and if the stator bar is damaged it will still pump,

although the jet is naturally reduced somewhat.

The accompanying diagram depicts the working principle diagrammatically and a



G, Controlling ring; J, Suction side; K, Discharge side; L, M, N, O, Blades.

brochure and a series of prints are available which give further constructional and technical details. It should be noted that the blades are non-metallic. We found "Fabroil" blades to stand up very well, creating no wear on the guide ring or pump casing.

I doubt if any type of pump approaches the "Centric" for efficiency except perhaps the Swedish "Imo," a worm impeller type used in the steering gear of certain Swedish navy vessels, as a positive actuating mechanism.—Yours faithfully,

G. HAROLD DURSTON,  
Durston, Lang & Co., Ltd

## Leather Trades Chemists

### Papers at Annual Meeting

THE annual meeting of the British Section of the I.S.L.T.C. was held recently at Leeds University. A steady increase in membership, the formation of local groups and the activities of the newly-instituted Technical Advisory Committee were referred to in the opening address of the president, Dr. Burton. Out of a number of papers presented, that on "The Disability of Bookbinding and Upholstery Leathers," by W. R. Atkin, deserves special attention.

In 1905, a committee of the Royal Society of Arts, in a report on "Leathers for Bookbinding" found that the mechanical strength of leathers should be preserved, that mineral acids ought to be avoided and that catechol tannins were dangerous. The use of pyrogallol tannins, especially sumach, was re-

commended, while iron salts and bichromates as strikers were considered as unsatisfactory. Although these findings related only to bookbinding leathers, failures in certain textile and other leathers could be ascribed to similar causes, e.g., trouble with nailed boots in tropical climates due to iron damages. The Procter-Searle method for determining acid was introduced before certain dyes, sulphated oils and synthetic tannins were used, which had since been found to effect the method. Later, some leathers, known to be virtually free from acid, were rejected because they were found to contain 0.25 per cent. free sulphuric acid by the Procter Searle method. Professor McCandlish suggested a simple method of neutralising any acidity with alkali, which worked well if applied sanely. Later, chemists became pH-conscious, and, in 1920, Bradley introduced the indicator paper test for acidity. Then came the methods of Pickard and Caunce, Innes, and the Atkins-Thompson technique. Innes did extensive work on existing library leathers, tracing soluble nitrogen compounds in the aqueous extracts of rotted library leathers, and found that this could be taken as a measure of oxidation. The speaker had also found ammonium salts in excess of the available amide nitrogen. In the light of recent work by Raper on intermolecular oxidation of tyrosine by tyrosinase, the mechanism of this oxidation became more evident. Steps which could be taken to stop the deterioration of leathers, included the modification of the McCandlish method by the use of salts of weak acids, the selection of the right tannins and the avoidance of metallic catalysts.

In a paper on the "Properties and Production of Dry Hide Chrome Leather," the author, W. R. Ingle, described a simple but effective chrome recovery plant, in which the precipitated chrome was recovered by centrifuging in a non-perforated basket type of machine, and the clear effluent automatically discharged.

A parliamentary inquiry into the working of the oil shale deposits at Glen Davis and Baerami, New South Wales, reveals that crude oil output at Glen Davis early next year is estimated at 6,000,000 to 7,000,000 gallons, yielding about 3,500,000 gallons of petrol annually. Glen Davis will not be in full production until 1946, when trading profit is expected to amount to £A234,000, against the 1943 trading loss of £A170,000. Under an extension plan for the production of up to 10,000,000 gallons of crude oil yearly, the life of Glen Davis is estimated at about 40 years, while that of Baerami would be 30 years.

## Personal Notes

PROFESSOR D. T. A. TOWNEND, of Leeds University, has been elected chairman of the newly-formed Yorkshire Section of the Institute of Fuel.

According to reports from Stockholm, SIR ALEXANDER FLEMING is likely, later this year, to receive the Nobel Prize for medicine for his discovery of penicillin. No Nobel awards have been made since 1939.

DR. E. E. TURNER, F.R.S., F.R.I.C., head of the department of organic chemistry at Bedford College, N.W.1, has been granted the title of Professor of Chemistry in the University of London.

MR. CHARLES DUKES, C.B.E., General Secretary of the National Union of General and Municipal Workers, has been elected chairman of the National Joint Industrial Council for the Gas Industry for 1944-45 in place of SIR DAVID MILNE-WATSON, who has held the chair since the inception of the Council in 1919.

The George Cross has been awarded to MR. R. A. S. BYWATER, factory development officer in a M.O.S. factory, for his gallant conduct in dealing with a large quantity of a sensitive and powerful explosive which, owing to the detonation of a small amount of the same material, was in a disturbed and critical condition. Not until he was personally satisfied that the worst danger had passed did he allow a small band of helpers to join him. They all worked together for several days on the task of making the explosive safe. MR. J. A. T. DAWSON and MR. R. HURST, experimental officers, Ministry of Supply, are awarded the George Medal for assisting in the operation.

## Obituary

MAJOR RICHARD LAUNCELOT BULLOCK, D.S.O., a former director of Edward Joy & Sons, Ltd., oil manufacturers, Leeds, died at Cheltenham on September 22, aged 73.

MR. EDWARD HARTLAND, who died at Whiston Hospital, Lancs., on September 18, aged 64, had many years' experience of the administration of the chemical industry. He was "born in the trade," being a native of Widnes and the son of the late William Hartland, the first manager of William Gossage & Sons. Mr. Edward Hartland began his commercial career on the audit staff of the United Alkali Company; during the last war he became office manager at the Gaskell-Deacon works and later occupied a similar position in the Pilkington-Sullivan works. Afterwards he was appointed to the I.C.I. chief accountant's office at Liver Buildings, Liverpool.

## Improved Moulding Powders

### Lac Research In India

THE annual report for the year ended March 31, 1943, issued by the Indian Lac Research Institute, Ranchi, Bihar, has just been received in this country. It states that the chemical section has rendered help to several firms in the commercial utilisation of the processes developed at the Institute. As an instance, Lac Products, Ltd., has already started large-scale production of modified shellac moulding powder.

With the establishment of a shellac moulding powder factory, and several inquiries from different Government departments for powders with special properties, intensive researches on improvements both in the manufacturing process and the properties of shellac moulded articles characterised the activity of the Institute throughout the year. Different grades of powder have been evolved for different types of article. The manufacturing process has been considerably simplified by the introduction of a specially designed steam-jacketed kneader in combination with a low-pressure distillation line, leading to a recovery of 90 per cent. of the spirit used in the fabrication of the modified shellac moulding powder at a time when the price of spirit has gone up from 12 annas to 4½ rupees a gallon. To avoid the use of spirit altogether, the powder has been prepared by the hot-roller mixing system, considerably reducing the percentage of accelerators by the introduction of small quantities of hardeners (metallic oxides). This work has been the subject of a patent application.

The influence of fillers and their particle size on the water-adsorption and strength of the moulded articles has also been investigated. Acetylated saw-dust, waterproofed hydrolysed saw-dust and waste paper-pulp improve the mechanical strength of the moulded articles, although the bulk factor of the powder is thereby increased.

A successful application of the shellac injection moulding powder has been made by undertaking to supply 60,000 anti-insect cream containers to the military. In the region of shellac varnishes, conspicuous success has been attained in the development of electrical insulating enamel, artificial leather, gas-resisting clothing, bobbin enamel, resistant coating for sheet iron and containers and instantaneous recording discs. Adhesives of good quality have been formulated in a number of manufacturing processes including the bonding of plywood.

Experiments on the comparative effects of cold storage and storage under ordinary conditions were completed during the year and a bulletin is being published embodying the results thereof.

## General News

**British Filters, Ltd.**, Maidenhead, have opened a showroom at 32, Berkeley Street, W.1, where technical inquiries will be received and appointments kept.

**Five Chinese professors**, who will be guests of certain colleges of Oxford and Cambridge Universities and of the British Council, have recently arrived in this country.

**The British Fluorspar Producers' Association** have drawn up prices for standardised grades of fluorspar and these operate from October 1. This is the first standardisation of fluorspar and the grades have been agreed after negotiations with various Government departments interested.

**Developments** which would carry the Shropshire coalfield right up to the Cannock Chase border were reported by Mr. Robert Foot, chairman of the Mining Association of Great Britain, at the end of a tour of the Midlands. He predicted the discovery of a virgin coalfield, with hundreds of years' supply of untouched coal.

**Chemical warfare** of a sort was indulged in by the Germans during the large-scale air attack on Britain in 1940. It has now been revealed that in September of that year packets of a red powder were dropped in Western England. The effect of the chemical was to cause acute dermatitis, but the powder was, in fact, an aniline dye for the use of airmen forced to come down in the sea.

**The usual bright mixture** of sense and nonsense is contained in the current issue of "600," the house magazine of George Cohen, Sons & Co., and associated companies. In addition it contains the announcement that this group of companies has a comprehensive Youth Training Scheme on hand, ready to be set going immediately after the war.

**The Council** of the Society of Public Analysts has under consideration the formation of a group dealing with physical methods of analysis, e.g.: spectrographic, photometric, and polarographic methods, and X-ray diffraction. Members wishing to join such a Group are asked to notify the Hon. Secretary of the Society, 78 Idol Lane, London, E.C.3.

**A method for the preparation of Adams' platinum oxide catalyst** in quantity is described by D. H. O. John (*J.S.C.I.*, 63, 8, p. 258) of the catalytic research department of May & Baker, Ltd. The recommended method has been tried by Johnson, Matthey & Co., Ltd., on a semi-commercial scale, and the catalyst has been found suitable for a wide variety of hydrogenations.

## From Week to Week

The adjourned general meeting of the Chemical Workers' Union has now been fixed for September 30 (2 p.m.) and October 1, (10.15 a.m.) at the Bonnington Hotel, Southampton Row, London, W.C.1. Twenty-two resolutions with amendments, will come before the meeting as well as suggested alterations to the rules, and the 17th biennial report of the National Executive Council will be presented.

**The Board of Trade** announces that all policies under the Business Scheme which are in force on September 30 will be extended until December 31, 1944, without further payment of premium or further action on the part of the policy holders. For additional insurance under the Business Scheme as well as for new insurance under the scheme, the rate of premium has been reduced to 1s. 8d. per cent. for the three months October 1-December 31, with a minimum premium of 5s.

**The National Union** of General and Municipal Workers has issued a writ against A. J. Gillian (General Secretary, Chemical Workers' Union), Bob Edwards (Lanes, Area Officer, C.W.U.), and J. W. Brown & Co. (Printers of the Union Journal) alleging libel in a circular and articles published in August issue of the *Chemical Worker* relating to an arbitration tribunal hearing on July 14, 1944, on wages and conditions claims on behalf of Union members employed by Bolton & Sons Ltd., Widnes. The plaintiff Union is claiming damages and an injunction.

## Foreign News

**Turkey's coal output** now averages about 11,000 tons daily.

**In Cyprus**, insecticides are now being produced locally from pyrethrum and it is possible that this local crop will replace the lost flower bulb export trade.

**The first shipment** of penicillin from the United States to Spain arrived by air in Madrid on Thursday last week, says Reuter from Madrid.

**The six German producers** of fluorine products have merged their firms to a syndicate named Fluorprodukte G.m.b.H. Their products have merged their firms in a syndicate, will henceforth be marketed in common.

**Production of manganese ore** in Spain has been raised to about 12,000 tons a year, it is reported. New mines have been opened at Huelva, which will produce 70 per cent. of the total, at Estopifán (Huesca), Cabrales (Oviedo), and Covadonga (Oviedo).

**The Spanish petroleum** monopoly company "Campse" has started the exploitation of the oil-shales in the Provinces of Lerida and Barcelona, near Santa Engracia, Salas, and Castellar.

**Early in June**, a new oil company was formed in France, entitled the Société Nationale des Pétroles du Languedoc Méditerranéen, with a capital of 200,000,000 francs, of which the Government owns 55 per cent. This company is now to take over the recently formed Société des Recherches et d'Exploitations Minières et Industrielles.

**A campaign to change** Cyprus from a wood-burning to an oil-burning country has had great success and many commercial installations have already been converted. This substitution is necessary to save the island's forests, threatened with extinction. Oil consumption is expected to raise to 10,000 tons this year.

**Production of fish-liver oil** as a source of vitamins has increased considerably in Canada for the last ten years. In 1933, only 280,000 pounds of liver, worth \$56,000, were taken, while in 1943, about 6,600,000 pounds were sold, which, with the oil produced, had a value of over \$2,800,000. Over two-thirds of this are being produced in British Columbia.

**The Portuguese Government** has authorised the establishment of three ammonium sulphate works at Alferrareda, Beja and Estarreja, with a yearly capacity each of 15,000-20,000 tons. The operating companies are Companhia União Fabril (C.U.F.), Sociedade Portuguesa de Azote, and Ammoniaco Português.

**Authorisation for the construction** of a plant (in Oregon) to produce alcohol by acid hydrolysis of wood waste has attracted attention to the possibilities of the process in America. In an article in *Chem. Met. Eng.* (1944, 51, 7, p. 100), C. Collins reviews the German methods and outlines the improved American process likely to be used in the new plant.

**Ethylhexanediol**, a colourless high-boiling glycol, has been produced on a commercial scale by Carbide and Carbon Chemicals, New York. Its viscosity is between those of ethylene glycol and glycerol, but its solubility in water is very limited. It can be employed as an insect repellent and shows promise as an intermediate for perfume fixatives, plasticisers, and synthetic resins.

**The capture of about 4½ tons** of quinine from the Germans during their retreat from Rome (enough to supply all Italy for several years) will go far towards counteracting the increase of malaria in Italy caused by the flooding of the Pontine Marshes and the Tiber delta. It has been ascertained that German scientists were specially consulted about the degree of flooding which would best favour the propagation of the *Anopheles* mosquito.

**It has recently been announced** by the Director-General of Supplies of the Union of South Africa that, at the most critical period of the war, over 500,000 tons of high-grade iron ore from the Thabazimbi (North Transvaal) mines of the South African Iron and Steel Industrial Corporation were exported to Great Britain. Within a few weeks of making the arrangement the first shipment was loaded and at sea.

**The hydrogenation** of ethylene, propylene, and 2-butene over six different iron catalysts has been investigated by P. H. Emmett and J. B. Gray (*J. Amer. Chem. Soc.*, 1944, 66, 8, p. 1338). Measurements of the kinetics, temperature coefficient and influence of promoter are included in their paper, and an even more detailed discussion awaits publication of the data concerning the extensive experiments recently undertaken by Beek.

**Production of fullers' earth** in the U.S.A. declined in the period 1931-41, largely owing to competition from synthetics and activated earths. Since then the trend has been reversed by war-time demands. According to the U.S. Bureau of Mines, the 1943 output of 271,667 tons was almost double that of 1940, but had not reached the record of 335,644 tons attained in 1930. Mineral-oil refining consumed 80 per cent, and vegetable-oil 7 per cent, of the total tonnage.

**From Finland** comes the news that a special committee has been established in Helsinki, charged with the scientific examination and eventual utilisation of inventions in the chemical field. In the first instance, this committee will concentrate its attention on biochemistry and pharmaceutical chemicals. Later on, it will concern itself with the application of modern chemical processes in the country's chemical industry, which, the report adds, has so far been little developed. The committee will carry out its work in a laboratory of Helsinki University.

**A patent has been granted** (U.S.P. No. 2,349,915) for the synthetic production of alcohol, light fuel gases and formaldehyde from water-gas produced from coal, wood or other sources of carbon. An ultra-high-frequency electrical field, of from 60,000 to 100,000 volts at between 6,000,000 and 37,000,000 cycles per second, in addition to the high temperatures and pressures customarily employed, is used. The carbonaceous raw material is first subjected to destructive distillation, and the gases driven off are burned to produce power in the plant. The hot carbonised residue is then treated with steam to produce a mixture of hydrogen and carbon monoxide. Proportions of the two gases are adjusted according to the product desired. Working pressures also vary, each product having its optimum. For methanol, for example, the pressure is raised to as much as 250 atmospheres, or 3750 lb./sq. in.

**The effect of heating** active nitrogen at various streaming pressures in the range of 15 to 33 mm. Hg by observation of its afterglow visually and by excitation of the iodine luminescence has been investigated by S. S. Joshi and A. Purushotham (*Proc. Ind. Acad. Sci.*, 1944, 19, A, 4, p. 159). It is found, apparently for the first time in this field, that the quenching of the afterglow is produced at a well-defined temperature, which increases with increase of the gas pressure. Existence of a glowless but chemically active form of nitrogen is considered improbable.

**In the Transvaal**, the Government metallurgical Laboratory has for some time past been investigating the possibility of using local sand for glassmaking. Two sources of supply have been examined—the natural sands in the Moot Valley, north of Pretoria, and the "dump sand" rejected from the Witwatersrand gold mines. Both these sources contain a heavy percentage of ferrous impurities, and an account of the methods tested for removal of these impurities is published in *S. Afr. Min. and Eng. J.*, 1944, 55, 1, pp. 507 and 525.

**The Oxelösund Ironworks**, one of Sweden's leading iron concerns, is erecting a new sheet-glass factory which will be completed this autumn. It will double the output at Oxelösund, which, at present, amounts to 10,000 sq. metres. The production of glass in Sweden has for some time been hampered by the rationing of soda. However, the situation has been eased by the increasing utilisation of scrap glass. In 1943, only manufacturers of certain glass products, such as laboratory glass, or glass for military and certain technical purposes were allotted the same quantities of soda as in the previous year. A thorough collection of scrap glass was organised and manufacturers state that 50 to 60 per cent. of the molten glass may consist of scrap, even for the production of high quality glass.

**U.S. consumption of lead** increased in 1943 owing to relaxation of Government conservation and limitation orders, but a marked decrease in refinery production and a decline in imports resulted in an excess of requirements over supply, and consequently the large stock of lead built up by the Government in 1942 from heavy foreign purchases was drawn upon. The production of refined primary lead, both from domestic and foreign ores, decreased 21 per cent. in 1943, the total from both sources being 116,998 short tons below the 1942 output. Ceiling prices for common lead of 6.35 cents a pound, St. Louis, and 6.50 cents New York, remained unchanged throughout 1943. The average weighted price received by the primary producers for all grades of lead sold in 1943 was 6.4 cents a pound, f.o.b. plant (6.3 cents in 1942).

**At a meeting** of the American Chemical Society, Dr. C. F. Kettering, vice-president of General Motors Corporation, announced the production of triptane, the powerful new motor fuel, in a pilot plant with a daily capacity of 5-10 barrels, by a "relatively simple" method which is still a military secret. It has been demonstrated, in the course of extensive tests, that triptane, especially when lead-tetraethyl is added, is four times as powerful as 100-octane gasoline. Triptane, trimethylbutane, was first made by Chavanne, a Belgian, in 1922. However, it could not be made cheaply in quantity. About 1939, some 300 gallons were produced by the Dow Chemical Company by the rather laborious Grignard method, using metallic magnesium, at a cost of about 35 dollars a gallon.

## Forthcoming Events

The Yorkshire section of the **Society of Chemical Industry** meets on **October 2**, at 6 p.m., in the Metropole Hotel, King Street, Leeds, to hear a paper on "Drying by Infra Red Radiation," by A. L. Roberts, B.Sc., Ph.D., A.R.I.C.

The London section of the **Institution of Rubber Industry** meets on **October 2**, at 6.30 p.m., in the Court Room, Caxton Hall, London, S.W.1. Mr. L. E. Masheter, M.A., F.I.R.I., will give an informal talk on "Inside the American Rubber Industry."

The London Section of the **Society of Chemical Industry** is holding its opening meeting of the 1944-45 session on **October 2**, in the rooms of the Chemical Society, Burlington House, W.1, at 2.30 p.m., when Dr. R. T. Colgate will deliver his address as chairman. His subject is "Technics of Tin," and the address will be illustrated by lantern slides of British and American plant, especially concerning continuous strip tinplate. Members of the Chemical Engineering Group are particularly invited to this meeting.

On **October 4**, at 2.30 p.m., Dr. H. R. Fehling will present the first paper in the series on "Thermal Insulation" to the **Institute of Fuel**, at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

The opening of the 103rd session of the **Pharmaceutical Society's** College and the presentation of prizes to be held at 17 Bloomsbury Square, London, W.C.1, on **October 4**, at 3 p.m. The inaugural address will be delivered by the President of the Society, Mr. F. G. Wells.

The inaugural meeting of the **Microchemical Group** of the **Society of Public Analysts** and Other Analytical Chemists will be held at the Chemical Society's Rooms, Burlington House, London, W.1, on **October 4**, at 2.15 p.m., to transact private business. At

3 p.m., Dr. Janet W. Matthews will read a paper on "The Development of Micro Methods in Analytical Chemistry." At 3.45 p.m., Mr. A. A. Houghton will present a paper on "The Micro-determination of Carbon by Wet Combustion."

The opening meeting of the Bristol and S.W. Counties sections of the **Chemical Society, Royal Institute of Chemistry, and Society of Chemical Industry** will be held on **October 5**, at 5.30 p.m. in the University Chemical Department, Woodland Road, Bristol, when a lecture on "Microchemistry" will be given by Dr. J. K. N. Jones.

A dance in aid of the R.I.C. Benevolent Fund will be held by the Birmingham and Midlands section of the **Royal Institute of Chemistry** at the Ritz Ballroom, Edmund Street, Birmingham, on **October 6** (Reception 6 p.m. Dancing 6.30 to 9.30 p.m.).

The Manchester section of the **Society of Chemical Industry** meets at the Grand Hotel, Aytoun Street, on **October 6**, at 5.45 p.m., to hear papers on "High-Frequency Heating," by E. T. Norris, and "Infra-Red Heating," by Miss A. M. Fletcher.

A joint meeting of the Food Group of the **Society of Chemical Industry** and of the Glasgow section will take place on **October 6**, at 7.15 p.m., in the Royal Technical College, George Street, Glasgow. The following papers will be presented: "Theoretical and Practical Aspects of Fish Curing," by Dr. J. M. Shewan and Dr. C. L. Cutting, and "Smoking and Drying of Meat," by Mr. T. Howard.

The Leeds local area section of the **Chemical Society** meets in the Chemistry Lecture Theatre of the University of Leeds, on **October 9**, at 6.30 p.m., when a paper entitled "Some Trends in Chemical Spectroscopy and the Study of Large Molecules" will be presented by W. H. Thompson, M.A., B.Sc., Ph.D.

The annual luncheon of the **Institute of Fuel** will be held at the Connaught Rooms, London, W.C.2, on **October 12** (12.30 for 1 p.m.). Lord Woolton will be the principal guest. The President, Dr. E. W. Smith, will address the meeting, and Dr. J. G. King will deliver the Melchett Lecture at 2.15 p.m.

The annual meeting of the **Society of Chemical Industry**, which was postponed in July, will take place on **October 13**, at 2.30 p.m., at the Royal Institution, Albemarle Street, W.1. The proceedings will commence with the conferment of Hon. Membership of the Society on Dr. Wm. Cullen, to be followed by the presentation of the Messel Medal to Professor A. V. Hill, F.R.S., who will read his address entitled "Science in India." Tea will be served in the wing library at 4 p.m.

The **British Association of Chemists** (London section) have arranged for a public

meeting to be held at the Wigmore Hall, at 6.30 p.m., on **October 18**, to discuss "The Safeguarding of Key Industries." Mr. Norman Sheldon, A.R.C.S., F.R.I.C., chairman of the Safeguarding of Key Industries (Scientific Equipment and Materias) Committee, will open the discussion by proposing a resolution urging the Government to give immediate and special consideration to the maintenance and development in Great Britain of those industries formerly covered by the Safeguarding of Industries Act (Part 1). Members of every scientific society are urged to attend. Anyone who would like to take part in the discussion and would care to have advance information of the proposals which will be put forward is invited to write to the Safeguarding of Key Industries Committee, 19 Charing Cross Road, London, W.C.2.

The annual general meeting of the **British Rheologists' Club** will be held on **October 21**, at 2.30 p.m., at the University, Reading. Papers on "The Measurement of Tack" will be read by Dr. N. A. de Bruyne and Dr. R. F. Bowles.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an — followed by the date of the Summary, but such total may have been reduced.)

WEST CUMBERLAND INDUSTRIAL DEVELOPMENT CO., LTD., Whitehaven. (M., 30/9/44.) September 4, £2250 charge, to A. C. Somervell, Windermere, and another; charged on Ennerdale Mill, Egremont (Cumberland) and two cottages. \*£268,000. August 7, 1944.

### Declarations of Solvency Filed

GEORGE MURTON & CO., LTD., Manchester, bleachers and dyers. (D.S.F., 30/9/44.) September 5.

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MABOR, LTD., London, W.C., manufacturers of magnesite products. (D.S.F., 30/9/44.) September 1.

SIMPSON & JACKSON, LTD., Manchester, bleachers and dyers. (D.S.F., 30/9/44.) September 5.

WILLIAM MOSLEY, LTD., Manchester, bleachers and dyers. (D.S.F., 30/9/44.) September 5.

## Company News

Aspro, LTD., announce a net profit, for the year ended June 30, of £275,810 (£267,720), and declare a final dividend of 15 per cent., making 25 per cent. (same).

Benzol and By-Products, LTD., announce the payment of the dividend on the 6 per cent. cumulative preference shares for the year to March 31, 1935.

Lever Brothers & Unilever, LTD., have declared an ordinary dividend of 5 per cent. (same) for 1943, payable on October 27. Net profit is £6,593,239 (£6,028,834).

## Chemical and Allied Stocks and Shares

ALTHOUGH inactive, stock markets have kept steady, industrial shares showing small gains on balance, with British Funds firm and inclined to move higher. Conflicting views remain current regarding the future outlook and it is realised that the Government's attitude to problems affecting industry in the post-war period have yet to be clearly indicated. Meanwhile, the tendency is to attempt to assess the significance of the social security proposals and other factors having an important bearing on prospects. Insurance shares showed a number of sharp declines.

Imperial Chemical improved slightly to 38s. 3d., the yield of well over 4 per cent. attracting attention as it compares favourably with the return on various other leading industrials. Borax Consolidated were steadier at 36s., and Dunlop Rubber strengthened to 46s. 9d. Moreover, Lever & Unilever improved to 43s. 3d., sentiment being influenced more by the increased profits of the group than by the fact that the dividend is again limited to 5 per cent., although earnings on the shares are much in excess of this. The conservative dividend policy is due to the absence of information as to the position of the Dutch Lever N.V. but this may be forthcoming before long. Shares of companies connected with building were better, British Plaster Board moving up to 38s. 6d., the capital increase proposals being regarded as indicating scope for still further expansion as time proceeds. Allied Ironfounders were better at 52s.,

also Pinchin Johnson at 37s. 1½d., and International Paint at 115s. Wall Paper Manufacturers deferred improved to 42s. 3d. Results of the last-named company are due shortly; but no change in the dividend is generally expected at this stage, although it continues to be assumed in the market that, as time proceeds, dividends will gradually return to pre-war levels. British Aluminium were 47s. xd., and British Oxygen 86s. 9d., while De La Rue were 18s., Erinoid 11s. 3d., and British Industrial Plastics 7s. 3d.

Iron and steels were better, including Tube Investments at 95s., Stewarts & Lloyds at 53s. 9d., Dorman Long at 27s., and United Steel at 24s. 9d. Dividend announcement of the last-named company is imminent. Elsewhere, Turner & Newall were firmer at 80s., as were the units of the Distillers Co. at 102s. 3d., also United Molasses at 36s., while Metal Box shares were 90s. Barry & Staines improved further to 51s., and Nairn & Greenwich to 73s. 9d. B. Laporte continued firmly held and quoted at 83s. 9d., while W. J. Bush were 65s., Monsanto Chemicals 5½ per cent. preference 23s., and Greiff Chemicals 5s. ordinary were 8s. Cellon 5s. ordinary were 24s., Burt Boulton 21s. 6d., and British Drug Houses 26s. 6d. Boots Drug rose further to 56s. 3d., Sangars were 27s. 10½d., and Timothy Whites 37s. 10½d., while Beechams deferred moved up to 19s. 3d.

Movements in textiles were small, British Celanese being 27s. 10½d., Courtaulds 55s. 6d., Bleachers 12s. 6d., and Calico Printers 16s. 9d. In other directions, awaiting the interim dividend announcement, Associated Cement at 65s. 6d. had a steady appearance. General Refractories 10s. ordinary eased to 16s. 7½d., while Pressed Steel were better at 30s. 7½d., as were J. Brockhouse at 77s. Pending the dividend announcement, Triplex Glass were 42s. 3d. In other directions, Imperial Smelting strengthened to 14s. 4½d., and Amalgamated Metal to 19s. 3d. Gas Light & Coke ordinary were 23s. 6d., and other gas stocks held recent gains. Oil shares were less firm, sentiment reflecting the lower Anglo-Iranian net profits, explained by the effect of E.P.T. Anglo-Iranian eased to 118s. 9d., "Shell" to 82s. 6d., and Burmah Oil to 88s. 9d.

## British Chemical Prices

### Market Reports

MOST traders report reasonably satisfactory trading conditions in the London general chemicals market this week and contract specifications are circulating fairly freely. Prices generally remain on a strong basis and a moderate weight of fresh business has been reported. In many cases a

scarcity of supplies is in evidence, and the bichromates and yellow prussiates remain tight. In the soda products section there has been a fair amount of inquiry for caustic soda and bicarbonate of soda, while Glauber salt and salt cake are in good call. Hyposulphite of soda is a brisk market and there has been a moderate inquiry for industrial refined nitrate of soda. Among the potash chemicals, offers of caustic potash and bicarbonate of potash are being promptly taken up, and permanganate of potash is a good market. A steady demand is reported for red and white leads and there is a good inquiry for zinc oxide and tin oxide which continue on a firm basis. Pressure for supplies is the chief feature of the coal-tar products section, and a quiet demand is in circulation for the pyridines. A steady trade is reported in pitch, while the toluols and xylools are fairly active.

**MANCHESTER.**—Price conditions on the Manchester chemical market during the past week have been steady to firm throughout the range, with, however, little in the way of actual movement to record. Fairly good deliveries are being called for of the general run of soda compounds, while restricted offers of the potash chemicals are being steadily absorbed. In sulphate of alumina and alum there is a fair call for supplies, while a steady demand for borax and boracic acid is reported. There is persistent pressure for supplies of both sulphuric and hydrochloric acids and also for citric and tartaric acids. The fertiliser trade is showing a seasonal improvement. In the tar products market creosote oil is in good demand and most of the light materials are being steadily called for.

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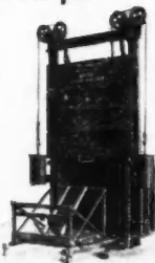
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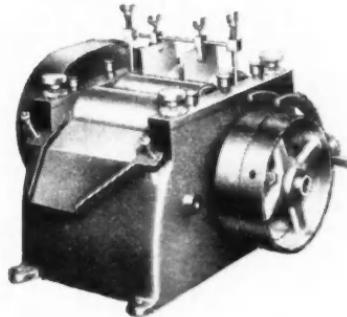
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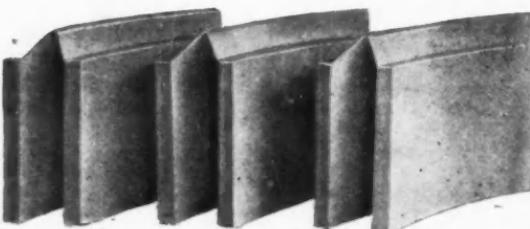
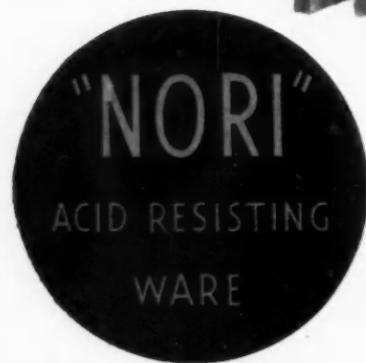
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